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13. ABSTRACT (Maximum 200 words)

The enclosed list of 12 publications contain papers on Silicon Carbide, Scanning Probe Microscopy, Fowler-Nordheim Field Emission, and Nanofabrication that were made possible by this grant.

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Novel Nanostructure Fabrication and Their Characterization By STM and AFM

The main thrust of this work has been to develop a methodology for fabricating and characterizing of nanometer-scale structures and to use it for a variety of applications. In particular, we have analyzed the role of adhesion in tapping-mode atomic force microscopy and analyzed its kinetics by comparing it to the dissipation vs. phase of a lossy, grazing impact oscillators

We have developed a conducting tip atomic force microscope that utilizes a dual feedback system to measure the dielectric properties of nanostructures. Also developed were v-shaped metallic-wire cantilevers for combined atomic force microscopy and Fowler-Nordheim imaging. Using these techniques, we were able, for the first time, to (a) fabricate silicon nitride nanostructures on a silicon substrate, and (b) to measure their current-dependent growth and dielectric strength. Another application of this system was to analyze (a) the effect of copper contamination from HF and APM on the integrity of a 3 nm gate oxide, and (b) the effects of moisture on Fowler-Nordheim characterization of thin silicon-oxide films. This work lead to a comparative study of doped, oxidized silicon by AFM, STM, and TAFM. Accompanied work included the measurement of stability and superstructure of squarylium dye TSQ Langmuir-Blodgett films and nano-patterning and single electron tunneling, both using STM

The students involved in this work where R. K. Workman, D. Iams, T. G. Ruskell, J. P. Hunt, C. A. Peterson, B. Vermeire, D. de la Cruz, and A. Nagarur. The Postdocs involved in this work were V. Weissenberger, J. Chen, T. Chen, D. Chen, G. E. Jabbour, X. Yao, and X. Hu. The rest of the authors are collaborators across campus, other universities, and companies. As the publications attest, the funding had a major impact on our capability to teach students and generate new physics, for which we are thankful.

The enclosed list of publications was made possible by this grant.

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